

Electrical Power Engineering (2)

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Lecture: 4

Tutorial: 4

Total: 8

Dr. Ahmed Mohamed Azmy

Department of Electrical Power and Machine Engineering

Tanta University - Egypt

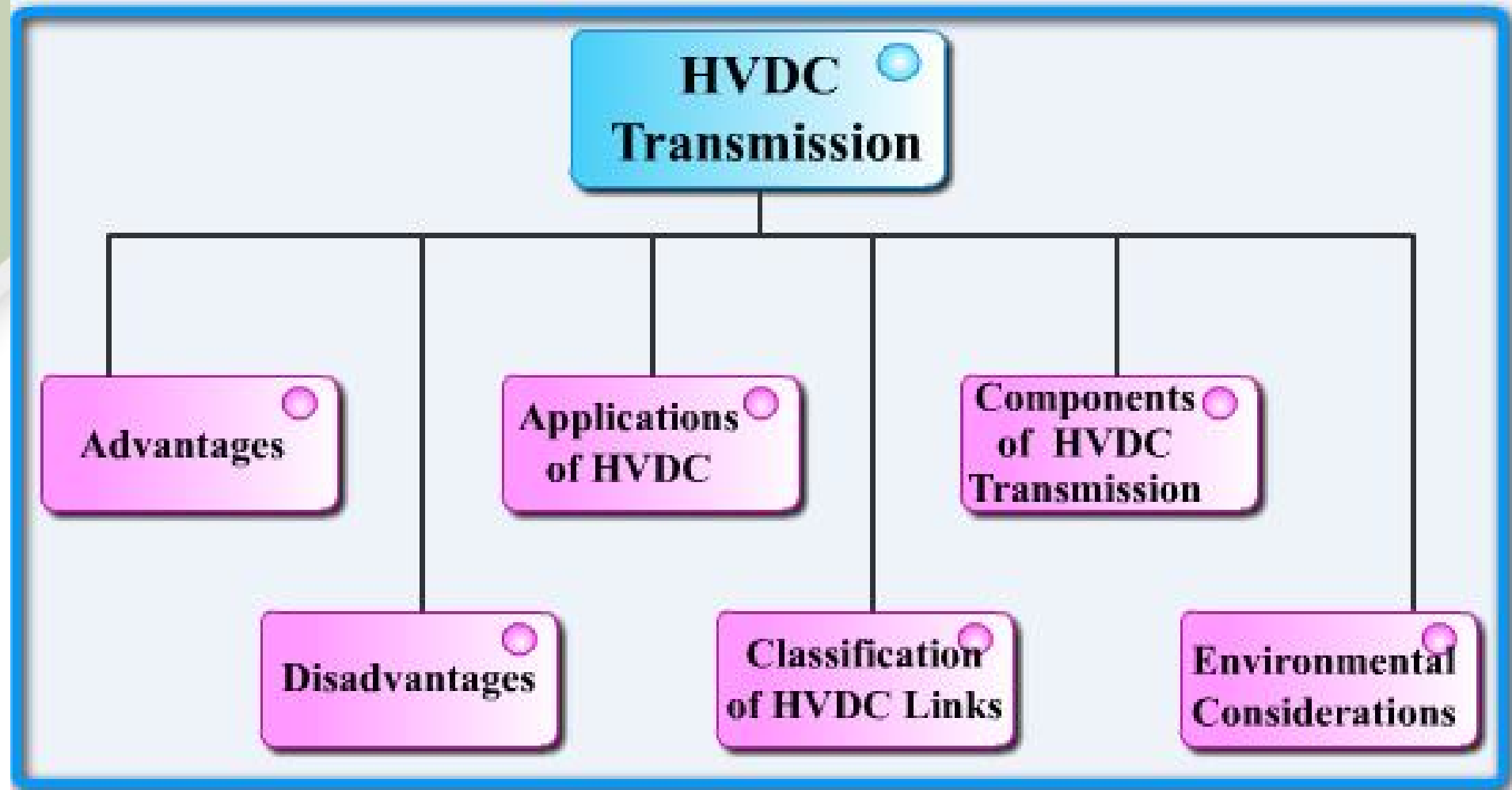


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High voltage dc overhead transmission line



High voltage dc overhead transmission line

The problems of ac transmission particularly in long distance transmission have led to the development of high voltage direct current (HVDC) transmission

However, as generation and utilization of power remain at alternating current, the HVDC transmission requires conversion at two ends, from ac to dc at sending end and back to ac at the receiving end

HVDC converters around the world

Location	Power MW	Location	Power MW
Chateauguay, Quebec	1000	Gotland, Sweden	269
Nelson River, Manitoba	3420	Kontl-Skan, Sweden-Denmark	550
Square Butte, North Dakota-Minnesota	500	Volgograd-Donbass, Russia	720
McNeill, Alberto	150	Etinzenricht, Germany	600
Vancouver, British Columbia	682	Wien SO, Austria	550
Virginia Smith at	200	Durnrohr, Austria	550
David A. Hamil,	100	Sardinia-Italy, Italy	300
Intermountain, Utah-California	1920	Inga-Shaba, Zaire	560
Pacific Intertie, Oregon-California	3100	Cabora Bassa, South-Africa-Mozambique	1920

Advantages of HVDC Transmission

1. Only two conductors per circuit are needed, consequently, dc transmission towers carry less conductor dead weight, and they can be smaller and less costly to fabricate
 2. With a single-line fault, the remaining conductors will still be functional through the ground of return
 3. No skin effect: lower resistance of a conductor
 4. A dc transmission link has no stability problem
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Advantages of HVDC Transmission

5. Using the HVDC transmission, the prime mover speed need not be confined to correspond to 50 or 60 Hz, but could rather be chosen for best economy.
 6. The dc itself does not require reactive power.
 7. No Ferranti effect (no limitations for the lines).
 8. For the same amount of transmitted power over the same size conductors, the dc line losses are smaller than with ac transmission lines.
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Disadvantages of HVDC Transmission

1. The lack of HVDC circuit breakers is regarded as limitation of HVDC transmission. In ac circuits, circuit breaker takes advantage of the current zeros occurring twice per cycle.
 2. The reliability and maintenance of converters are major problems for dc systems with mercury-arc converters.
 3. Production of harmonics due to converter operation and need for filters in both sides of dc systems
 4. High cost of conversion equipment.
 5. Complexity of control
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